FRUGAL

TECHNOLOGIES

Why Frugal Propulsion?

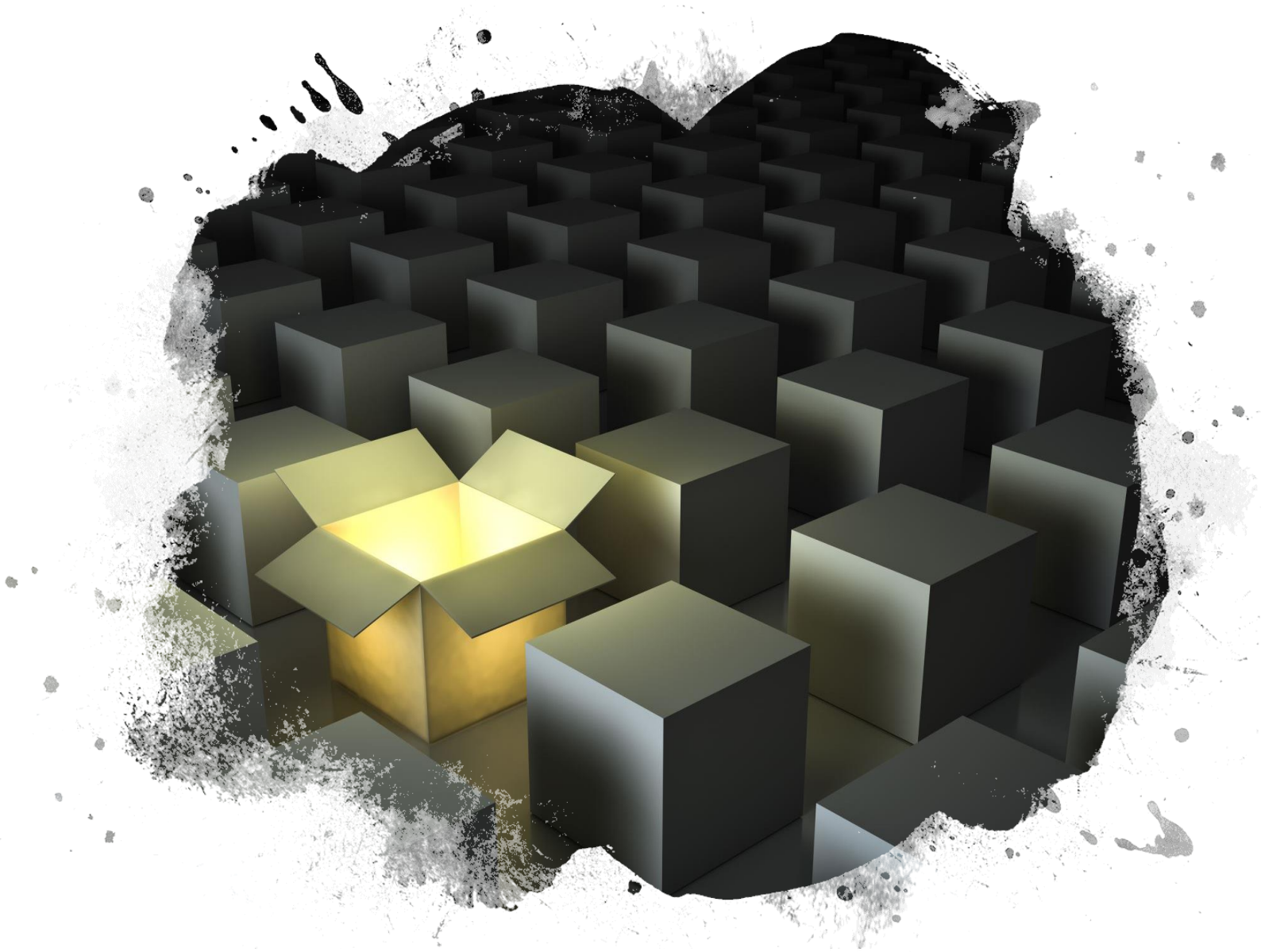
- Proven significant savings on fuel consumption
- Significantly reduced CO2 emissions
- Open API for business intelligence integration
- Cross-validated measurements yielding improved data quality

Who is it for?

Frugal Propulsion shines on vessels that do relatively long voyages, in particular:

- Vessels that have controllable pitch propellers
- Vessels that cannot use battery power or other alternative power sources

What’s in the package?



The bridge HMI display

Our HMI solution is basically an additional power handle that integrates with the existing PCS solution. When our panel is in control, you get:

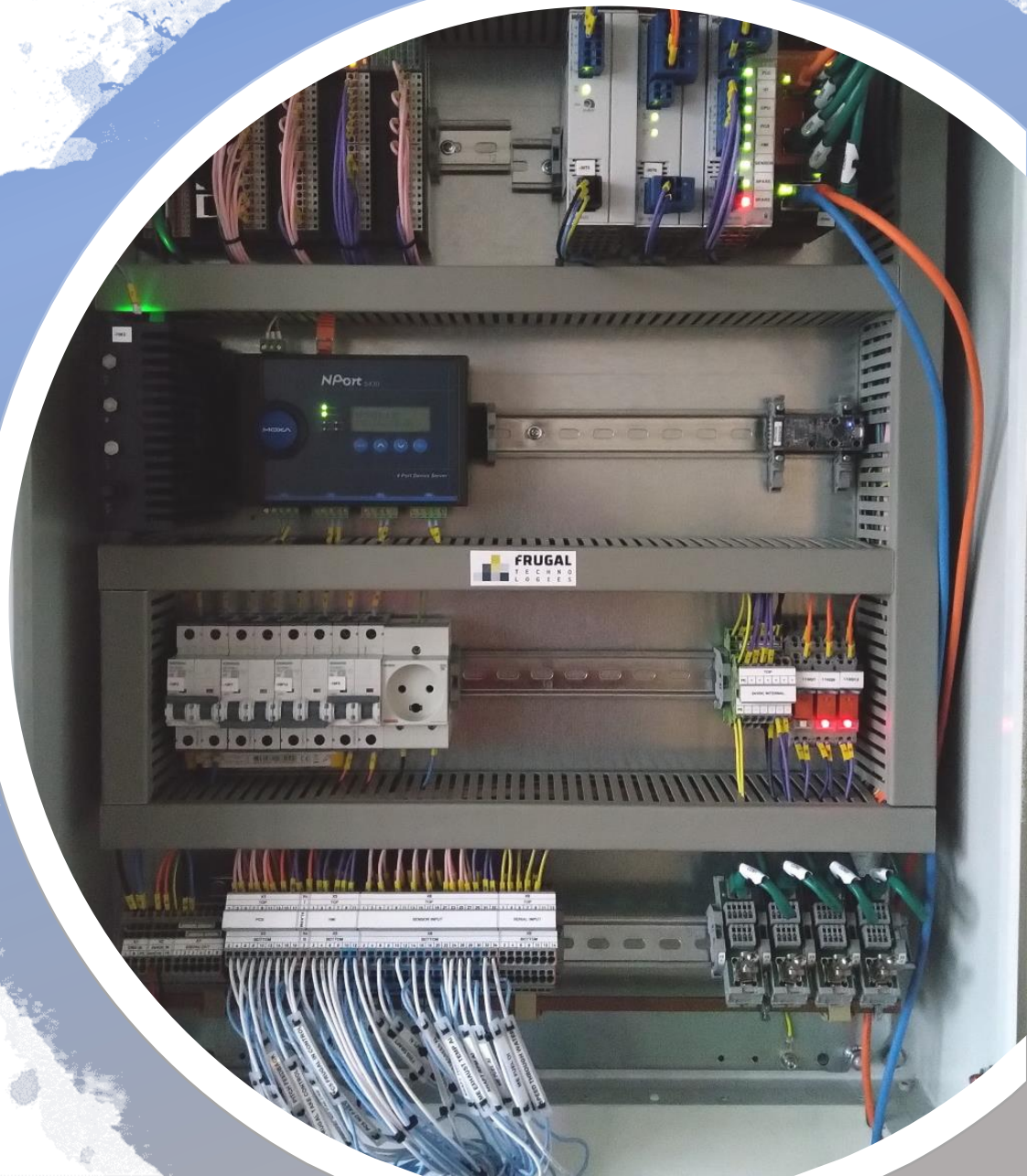
- Propulsion according to the latest available cloud generated propeller curve
- The option to use our speed pilot
- The option to use our power pilot

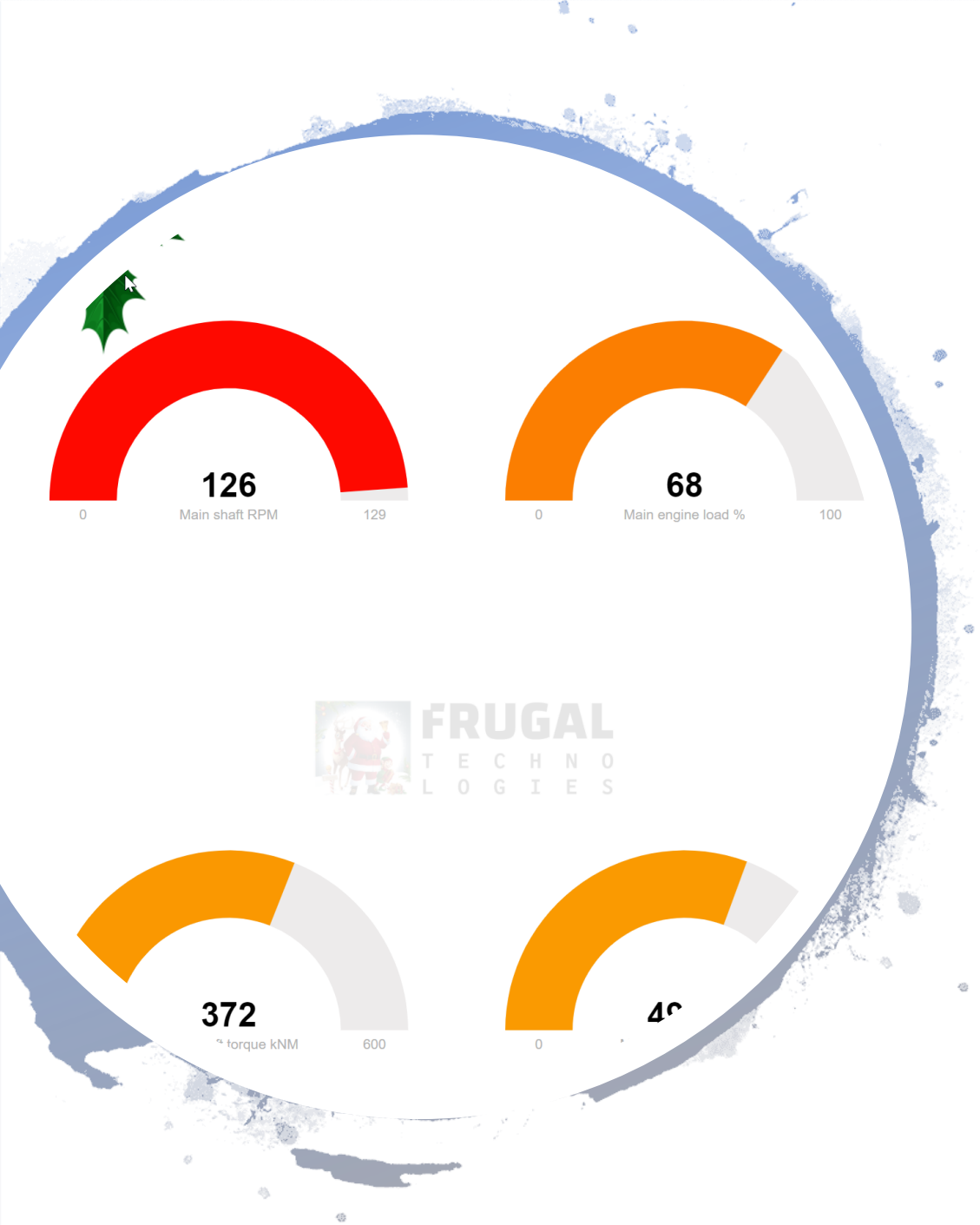
All options serve to improve propulsion efficiency.

The Electronics Cabinet

The electronics cabinet serves several purposes:

- Integration point with the existing PCS solution
- Integration point with the cloud solution
- Integration point for sensor input
- Backend for the bridge HMI panel
- Backend for other on-board displays

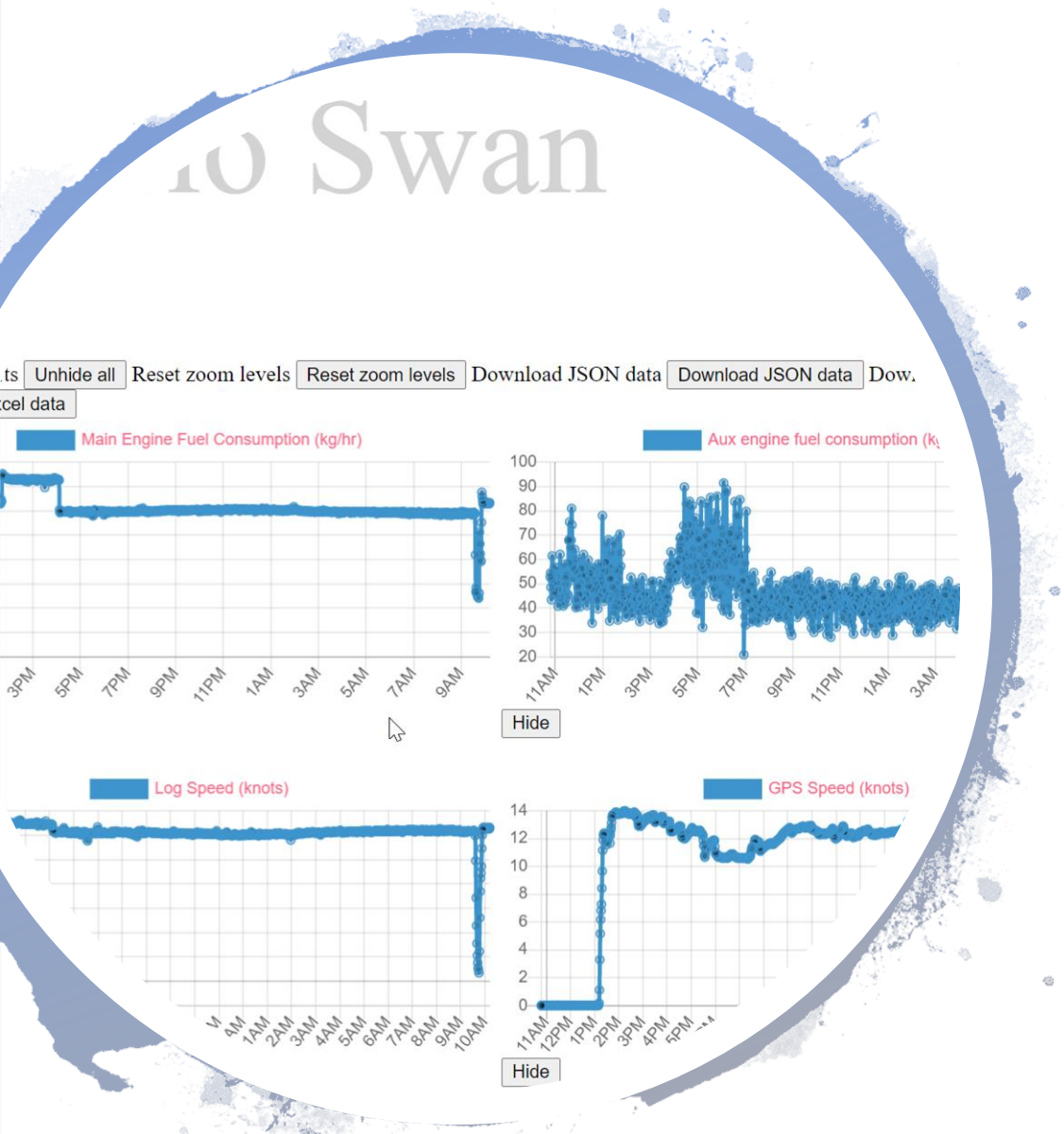




Additional displays

We also provide additional read-only displays that can be customized to show whatever information is required by the crew:

- Implemented in HTML5/JS
- Backend is the FPEC which serves websocket data.



Data availability

Frugal Propulsion collects a lot of data – we make it freely availble to vessel owners:

- Integration with BI solutions such as MS PowerBI
- Data and prediction services for other vendors, such as MHTech

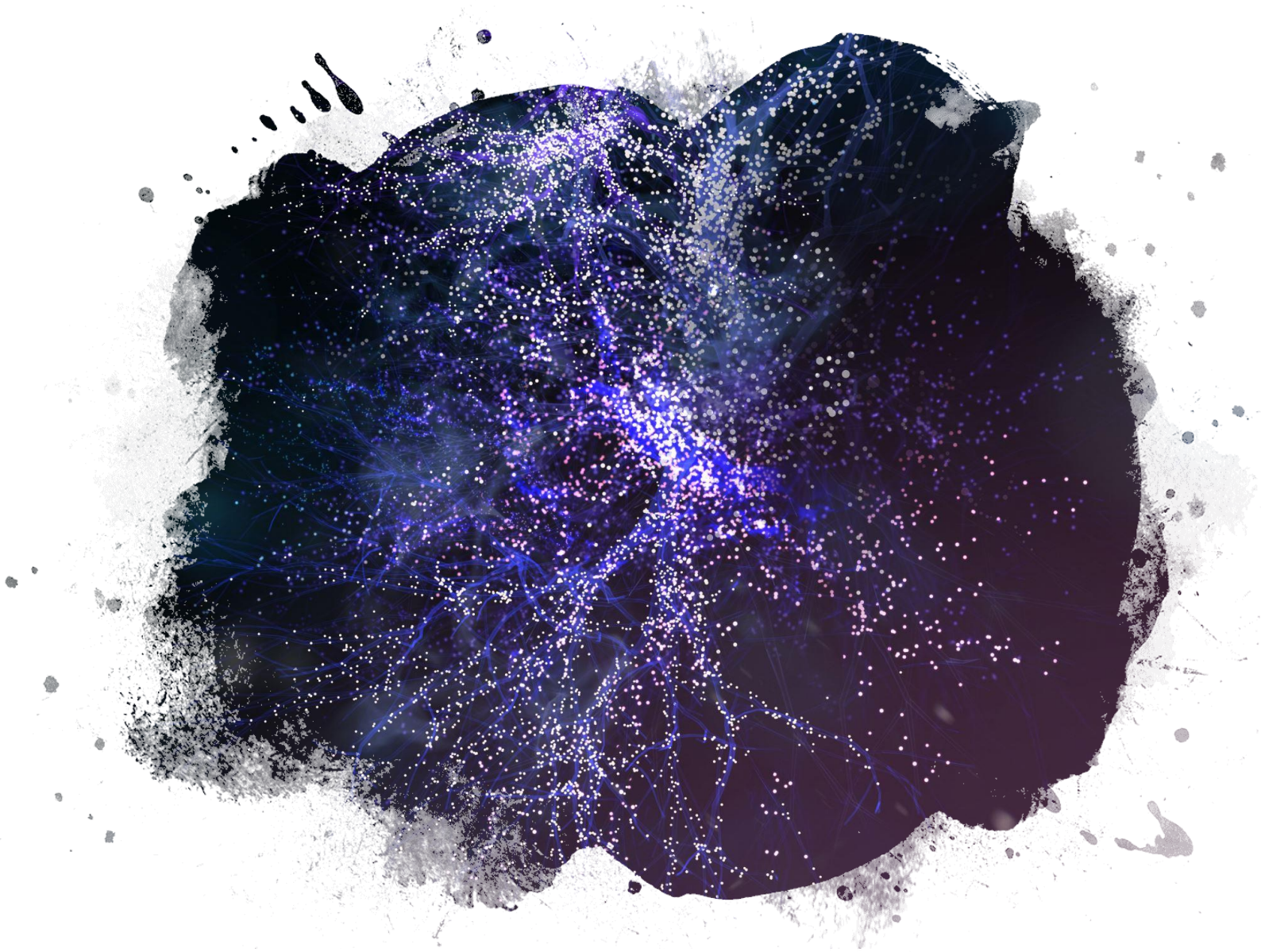
Class society approved

Both the electronics cabinet and the bridge HMI panel are approved by:

- Bureau Veritas
- DNV-GL

We have chosen not to worry about the additional read-only displays in that respect.

How does it do its magic?

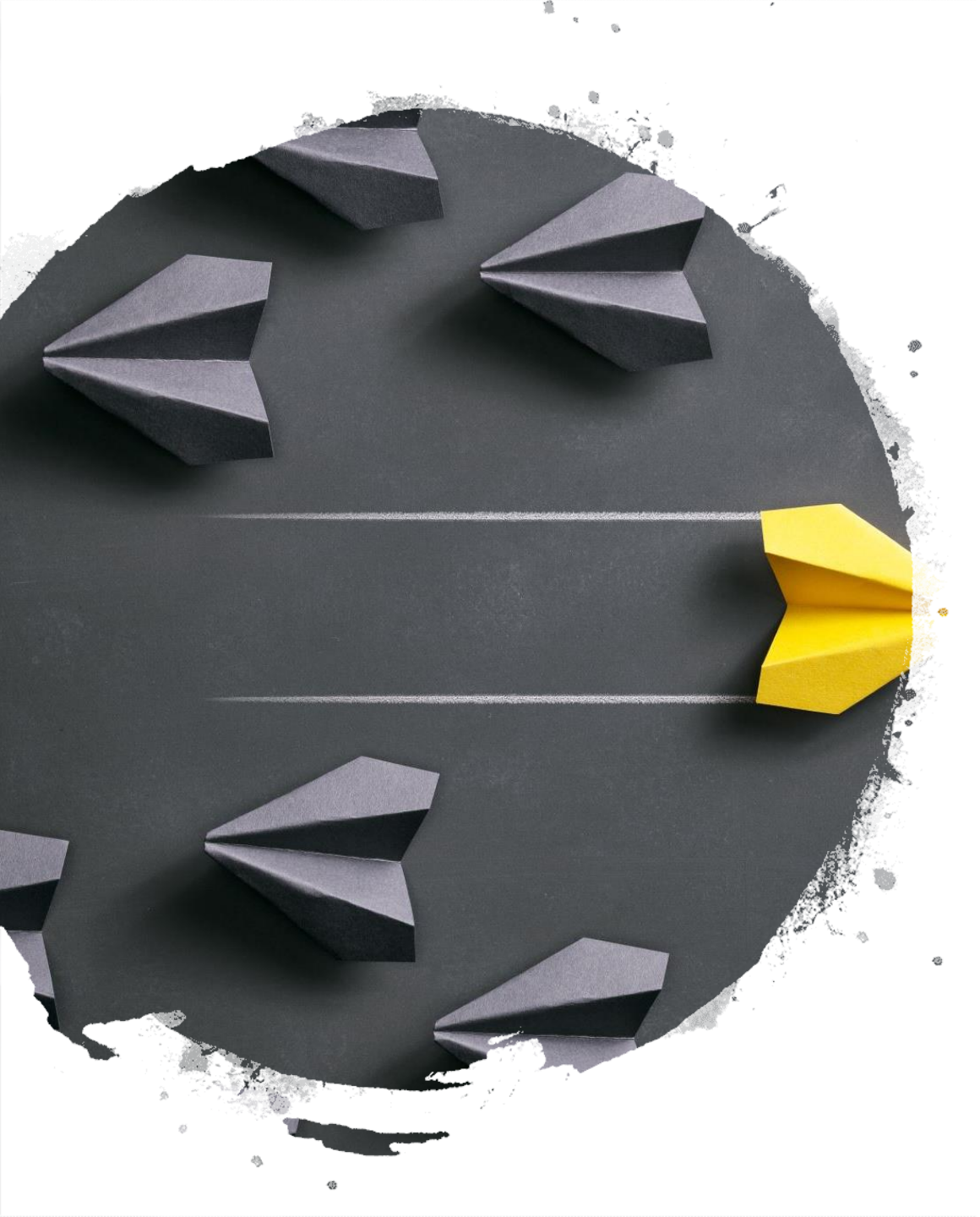


Things that impact propulsion efficiency

Propulsion efficiency is a product of many factors:

- Engine best performance points
- Hull performance at varying speeds
- Hull performance at varying conditions
- Vessel trim
- Weather, waves and swells

And of course the combination of engine RPM and propeller pitch



Some are classifiers

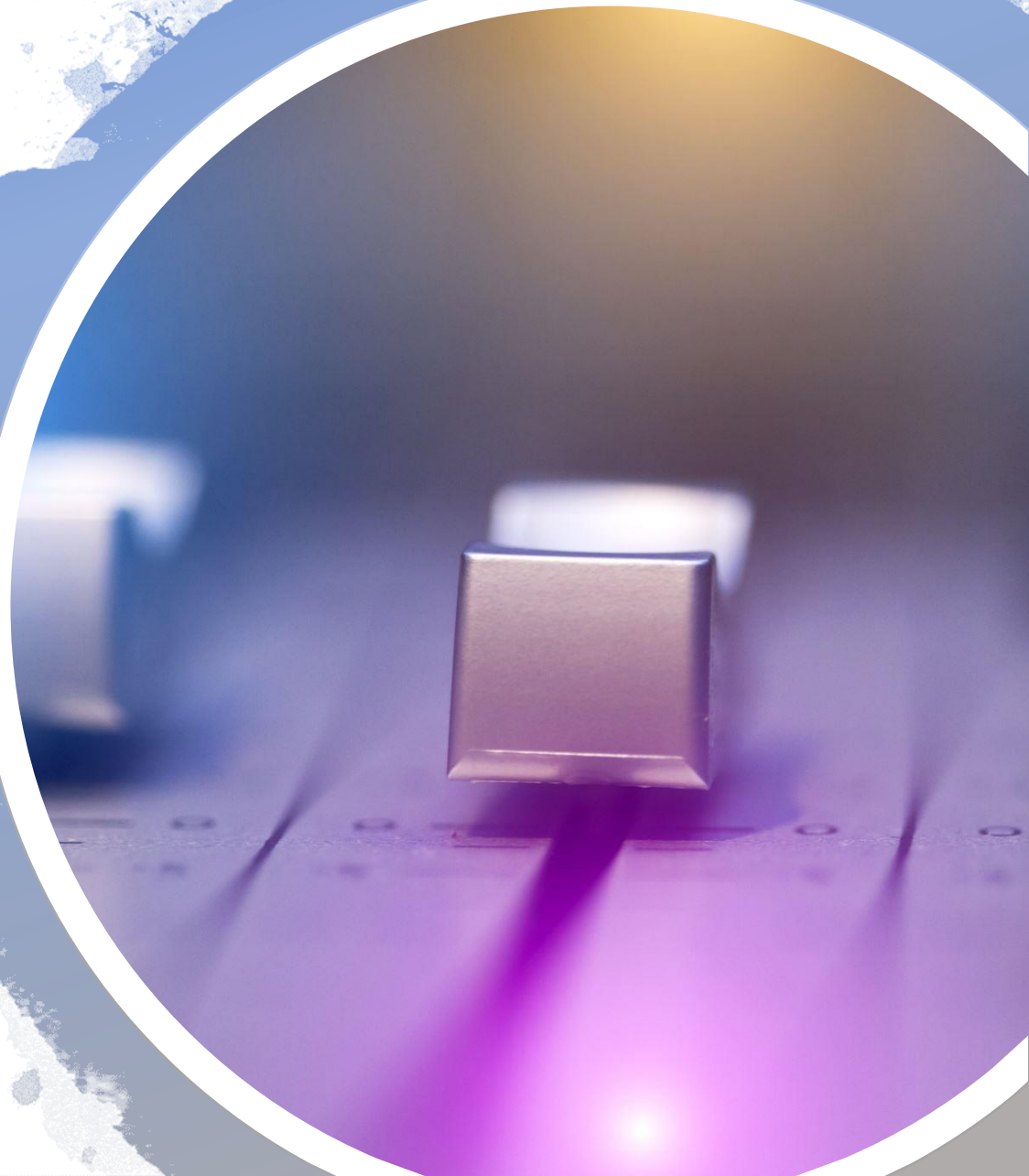
Some variables are really not up to us controlwise:

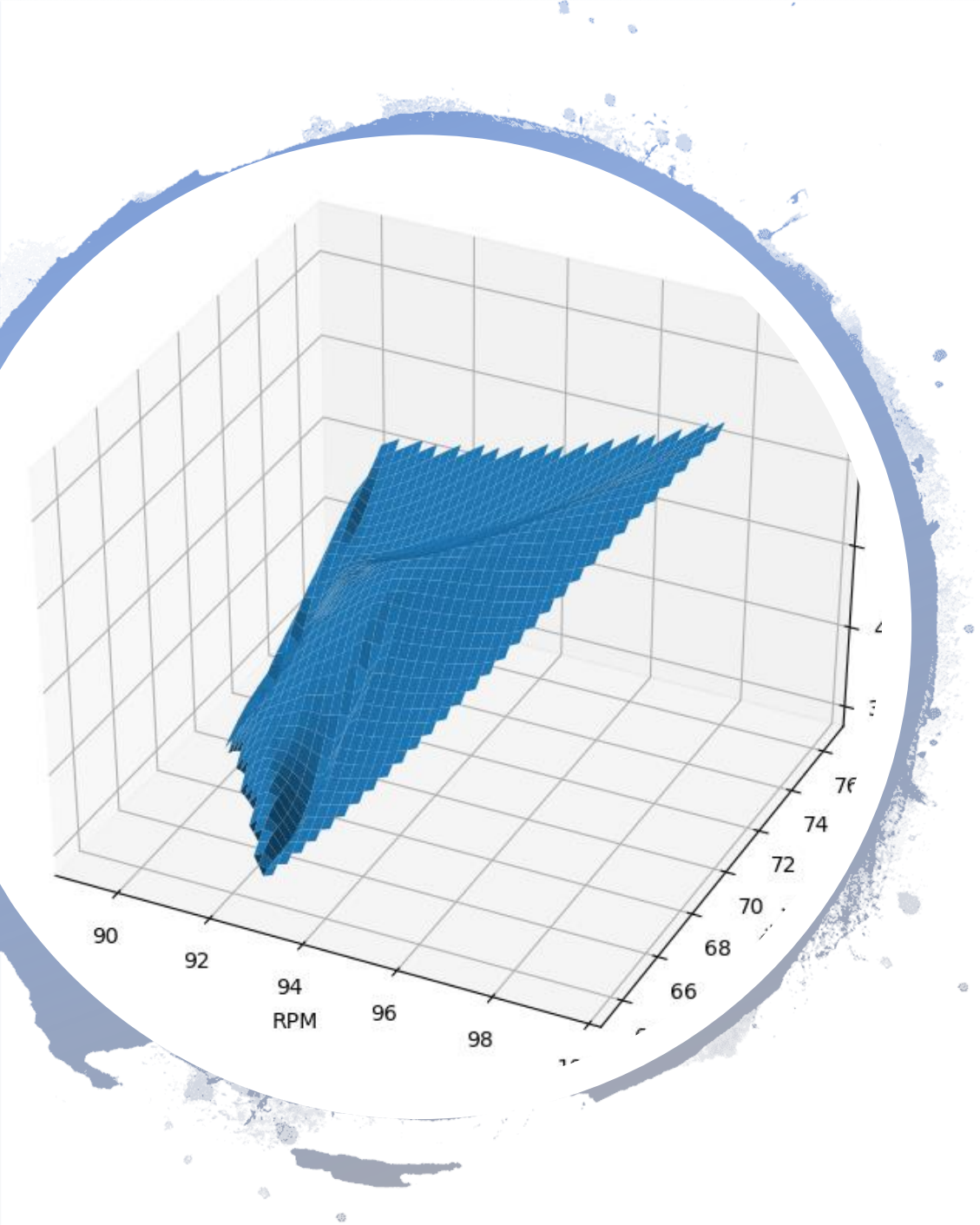
- Weather, waves and swells add to the complete picture but we can mainly make a note of the impact
- The same is true for vessel draft. This is a critically important parameter – but not an adjustable one
- Trim also has a significant impact on performance and is to some extent adjustable.

Some we can control

The parameters we can adjust using Frugal Propulsion are quite simply:

- The engine RPM
- The propeller pitch

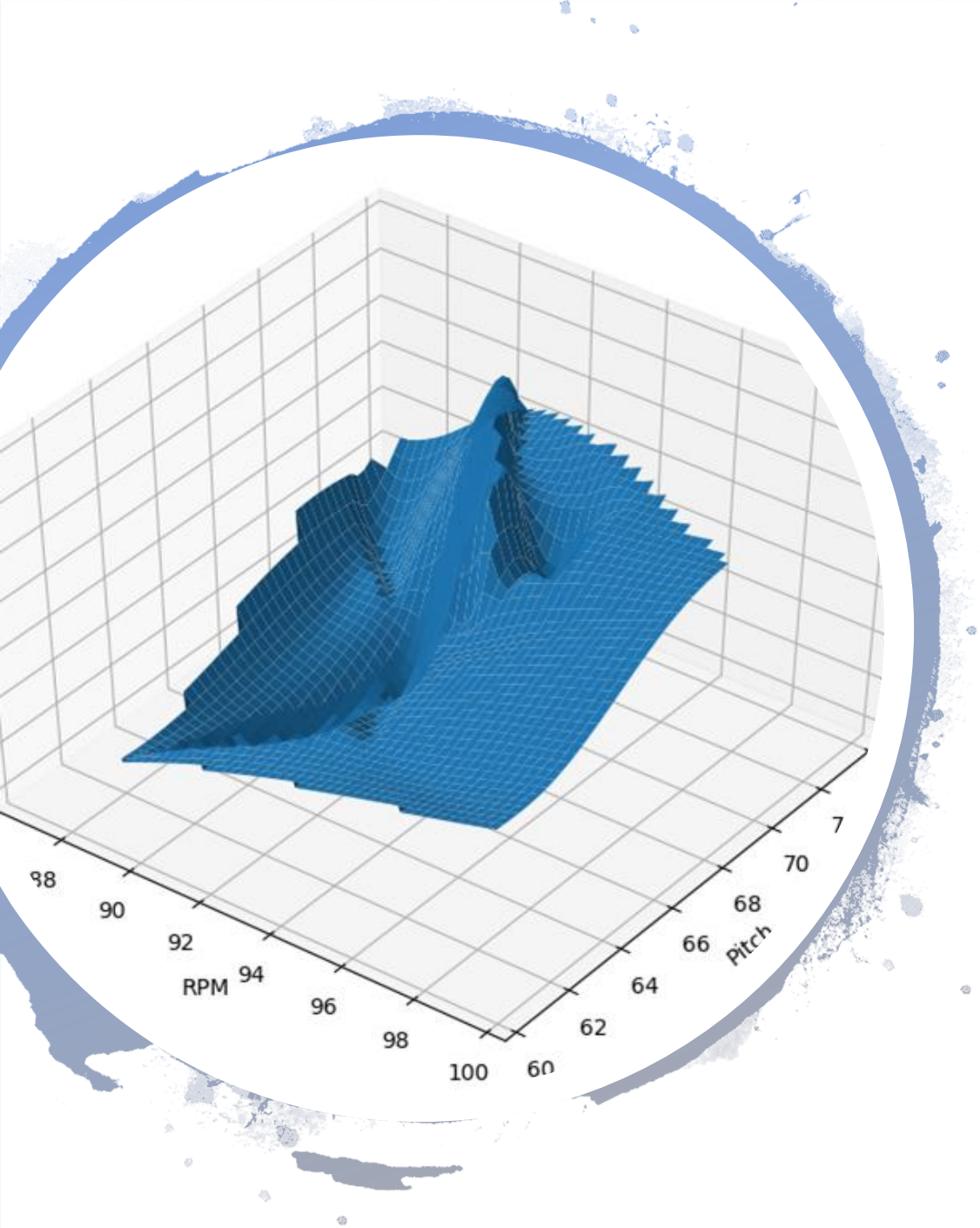




The result

Combining classifiers with the data we continuously collect on engine power, fuel consumption, speed and so on, we can generate propeller curves that match the vessel's current condition

The plot on the left shows the power response at high draft on one of our vessels



… the result

And this plot shows the power response at low draft on the same vessel.

- Clearly, certain combinations of RPM and pitch are good for low draft, while others are better suited at higher draft
- Since power is directly proportional with fuel consumption, it makes sense to take this into consideration!

Results and future plans

Patented solution

Frugal Propulsion has successfully been patented with the European patent scheduled for final publishing in 2021.

How much fuel can we save?

Going by the results we have from our current installations, we can save quite significantly on the fuel budget:

- Uni-Tankers Endelo Swan is saving 8,2%, weighted according to their particular usage pattern (6-20% overall)
- Royal Arctic's Malik Arctica is saving 10-15%
- ROI is low – around 12 months for Malik Arctica, even when including a VFD installation

Going green(er)

Saving fuel translates directly into reducing CO2 emissions.

Frugal Propulsion is an easy way of coming closer to IMO compliance

Installation is realtively simple – no rotors, no alternative fuels, no big rebuilds. Just making better use of what is already there

What do we want?

We really want Frugal Propulsion to be a value-added system that lives alongside existing systems.

- We have proven that machine learning and intimate understanding of propulsion physics can go a long way towards making shipping greener – and more profitable
- On top of that, we see a lot of avenues for further improvement that can save even more, using the components we have already developed.